In the Claims

Claims 1-3 (Canceled)

4. (Currently amended) The method of claim 23 wherein said support matrix is a gel, sol-gel, scaffold, hydrogel, sponge, honeycomb or lattice prepared from a compound selected from the group consisting of a thermo-reversible gelation hydrogel, collagenous gel, Type I collagen, Type II collagen, Type IV collagen, gelatin, agarose, collagen containing proteoglycan, collagen containing glycosaminoglycan, collagen containing glycoprotein, fibronectin, laminin, a growth factor, cytokine, elastin, hyaluronin, fibrin, a synthetic polymeric fiber made of polylactic acid, a synthetic polymeric fiber made of polyglycotic acid, a synthetic polymeric fiber made of polyamino acid, polycaprolactone, polyamino acid, polypeptide gel, a copolymer thereof and a combination thereof.

5. (Original) The method of claim 4 wherein said matrix is the thermo-reversible gelation hydrogel (TRGH) wherein said TRGH is in a liquid sol state at temperatures of below about 30°C and wherein said thermoreversible hydrogel polymer is in a solid sol state at temperature above about 30°C and further wherein said thermo-reversible gelation hydrogel is either deposited into the lesion cavity formed below the top sealant or between the bottom and top sealants as the neo-cartilage construct comprising chondrocytes embedded therein or wherein said TRGH is deposited into said cavity as a space holding gel without any neo-cartilage chondrocytes.

6. (Currently amended) The method of claim 5, wherein ~~the neo-cartilage construct comprises cultured differentiated~~ said autologous or heterologous chondrocytes are cultured and differentiated ~~or cells which could be differentiated into chondrocytes~~.

7. (Currently amended) The method of claim 24 wherein said bottom sealant is selected from the group consisting of gelatin, a copolymer of polyethylene glycol and poly-lactide or poly-glycolide, periodate-oxidized gelatin, 4-armed pentaerythritol thiol and a polyethylene glycol diacrylate, 4-armed tetra-succinimidyl ester or tetra-thiol derivatized PEG, photo-polymerizable polyethylene glycol-co-poly(α-hydroxy acid) diacrylate macromer, 4-armed polyethylene glycol derivatized with succinimidyl ester and thiol ~~plus~~ further cross-linked with methylated collagen ~~hydrogel~~, derivatized polyethylene glycol (PEG), ~~derivatized~~ polyethylene glycol (PEG) cross-linked with alkylated collagen, tetra-hydrosuccinimidyl or tetra-thiol derivatized PEG, cross-linked PEG with methylated collagen, and a combination thereof.

8. (Previously presented) The method of claim 7 wherein the bottom sealant is the cross-linked PEG with methylated collagen.

9. (Original) The method of claim 8 wherein the neo-cartilage construct is prepared *in vitro*, *ex vivo* or *in vivo*.

Claims 10-12 (Canceled)

13. (Original) The method of claim 12 wherein the hydrostatic cyclic pressure is from about 0.05 MPa to about 3 MPa at 0.1 to about 0.5 Hz or constant pressure is from about zero to about 3 MPa above atmospheric pressure and wherein such pressure is applied for about 7 to about 28 days.

14. (Original) The method of claim 13 wherein said hydrostatic pressure is preceded or followed by a period of about zero to about 28 days of atmospheric pressure.

15. (Original) The method of claim 14 wherein said perfusion

flow rate is from about 5 µL to about 50 µL/minute.

16. (Original)The method of claim 15 wherein said perfusion flow rate is about 5 µL/minute.

17. (Original) The method of claim 16 wherein said perfusion and pressure are applied at from about 2% to about 5% of oxygen concentration.

Claim 18 (Canceled)

19. (Currently amended) The method of claim 22 wherein said neo-cartilage ~~implant is overgrown by~~ construct is integrated into a native cartilage and covered with said superficial cartilage layer ~~and~~ wherein said superficial cartilage layer is formed, in time, of the top sealant and wherein said top sealant is polyethylene glycol cross-linked with methylated collagen and wherein said superficial cartilage layer grows into or provides the same type of surface as a synovial membrane of an intact joint ~~and a surrounding native synovial membrane are mutually integrated~~.

Claim 20 (Canceled)

21. (Previously presented) The method of claim 5 wherein said neo-cartilage construct comprises a thermo-reversible gelation hydrogel and is implanted into the lesion as a liquid sol wherein upon warming the construct to a body temperature, the liquid sol is converted to a solid gel and wherein this process can be reversed by cooling said lesion to a temperature below 30°C permitting removal of said gel as the sol.

22. (Currently amended) A method for treatment of ~~an articulate~~ cartilage lesion and for formation of a superficial cartilage layer, said method comprising ~~surgically~~ implanting a

neo-cartilage construct into said lesion and covering said neo-cartilage construct ~~implant~~ with a layer of a top biocompatible adhesive sealant deposited over said implanted neo-cartilage construct, wherein said top sealant is a derivatized polyethylene glycol ~~(PEG)~~ with tetrahydrosuccinimidyl or with tetra-thiol or polyethylene glycol cross-linked with alkylated collagen and wherein deposition of said top sealant over said neo-cartilage construct results in formation of the superficial cartilage layer that overgrows and protects said neo-cartilage construct implanted within said lesion.

23. (Currently amended) A method for treatment of a cartilage lesion and for formation of a superficial cartilage layer [The method of claim 22 ], comprising steps:

a) obtaining an autologous or heterologous cartilage and subjecting said cartilage to a process for isolating of chondrocytes or providing cells that could be differentiated into chondrocytes;

b) expanding and suspending said isolated chondrocytes in a gel, sol, sol-gel, collagen or collagen-containing solution;

c) seeding said chondrocytes suspension into a support matrix, wherein said support matrix is a three-dimensional structure containing plurality of pores producing a seeded matrix construct;

d) preparing ~~said~~ a neo-cartilage construct for implantation into said cartilage lesion by subjecting said seeded support matrix construct to conditions promoting activation and propagation of said chondrocytes within said support matrix wherein said ~~suitable~~ conditions for activation and propagation of chondrocytes comprise a cyclic or constant hydrostatic pressure, a static pressure, ~~medium~~ flow rate of a culture medium, temperature under which said activation and propagation is

performed, length of time, cell density, oxygen or carbon dioxide content, each alone or in combination,

wherein the hydrostatic pressure is from about zero MPa to about 10 MPa above atmospheric pressure at about 0.01 to about 1 Hz, wherein the time for applying the hydrostatic pressure is from zero to about 24 hours per day for from about one day to about ninety days, wherein said hydrostatic pressure is preceded or followed by a period of zero to about 24 hours per day of a static atmospheric pressure for from about one day to about ninety days, wherein the flow rate is from about 1 µL/min to about 500 µL/min, wherein the cell density is from about 3 to 60 millions and wherein the oxygen concentration is from about 1 to about 20%;

e) implanting said neo-cartilage construct into said cartilage lesion; and

~~e)~~

f) depositing the top biocompatible adhesive sealant over the neo-cartilage construct wherein said top sealant is the polyethylene glycol cross-linked with methylated collagen,

wherein said deposition of said top sealant over said implanted neo-cartilage construct results in formation of the superficial cartilage layer that overgrows and protects said neo-cartilage construct implanted within said lesion.

24. (Previously presented) The method of claim 23 additionally comprising a step of depositing a layer of a bottom biocompatible adhesive sealant into said cartilage lesion before implanting said neo-cartilage construct, wherein said sealant may be the same as,

or different from the top sealant.

25. (Previously presented) The method of claim 24 wherein said chondrocytes are isolated from extracellular matter by enzymatic digestion of the cartilage.

26. (Previously presented) The method of claim 23 wherein said step of depositing the top sealant over the neo-cartilage construct results in formation of the superficial cartilage layer over the treated lesion.

27. (Previously presented) The method of claim 26 wherein said superficial cartilage layer is integrated into a synovial membrane.

28. (Previously presented) The method of claim 27 wherein such formation and integration occurs in two or three months following the surgery.

29. (New) The method of claim 22 wherein said alkylated collagen is methylated collagen.

30. (New) A method for treatment of a cartilage lesion and for formation of a superficial cartilage layer, said method comprising steps:

a) obtaining an autologous or heterologous cartilage and subjecting said cartilage to a process for isolating of chondrocytes or providing cells that could be differentiated into chondrocytes;

b) expanding and suspending said isolated chondrocytes in a gel, sol, sol-gel, collagen or collagen-containing solution;

c) seeding said chondrocytes suspension into a support matrix, wherein said support matrix is a three-dimensional structure containing plurality of pores

producing a seeded matrix construct;

d) preparing a neo-cartilage construct for implantation into said cartilage lesion by subjecting said seeded support matrix construct to conditions promoting activation and propagation of said chondrocytes within said support matrix wherein said conditions for activation and propagation of chondrocytes comprise a cyclic or constant hydrostatic pressure, a static pressure, flow rate of a culture medium, temperature under which said activation and propagation is performed, length of time, cell density, oxygen or carbon dioxide content, each alone or in combination, wherein the hydrostatic pressure is from about zero MPa to about 10 MPa above atmospheric pressure at about 0.01 to about 1 Hz, wherein the time for applying the hydrostatic pressure is from zero to about 24 hours per day for from about one day to about ninety days, wherein said hydrostatic pressure is preceded or followed by a period of zero to about 24 hours per day of a static atmospheric pressure for from about one day to about ninety days, wherein the flow rate is from about 1 μL/min to about 500 μL/min, wherein the cell density is from about 3 to 60 millions and wherein the oxygen concentration is from about 1 to about 20%;

e) depositing a layer of a bottom adhesive sealant into said cartilage lesion before implanting said neo-cartilage construct;

f) implanting said neo-cartilage construct into said cartilage lesion; and

g) depositing a layer of a top adhesive sealant over the neo-cartilage construct wherein said top

sealant is the polyethylene glycol cross-linked with methylated collagen,
wherein said bottom and top sealant may be the same or different,
wherein said deposition of said top sealant over said implanted neo-cartilage construct results in formation of the superficial cartilage layer that overgrows and protects said neo-cartilage construct implanted within said lesion.

31. (New) The method of claim 30 wherein said top or bottom sealant is selected from the group consisting of gelatin, a copolymer of polyethylene glycol and poly-lactide or poly-glycolide, periodate-oxidized gelatin, 4-armed pentaerythritol thiol and a polyethylene glycol diacrylate, 4-armed tetra-succinimidyl ester or tetra-thiol derivatized PEG, photo-polymerizable polyethylene glycol-co-poly(α-hydroxy acid) diacrylate macromer, 4-armed polyethylene glycol derivatized with succinimidyl ester and thiol, alone or further cross-linked with methylated collagen, derivatized polyethylene glycol (PEG), polyethylene glycol (PEG) cross-linked with alkylated collagen, tetra-hydrosuccinimidyl or tetra-thiol derivatized PEG, PEG cross-linked with methylated collagen and a combination thereof.

32. (New) The method of claim 31 wherein said top or bottom sealant is the polyethylene glycol cross-linked with methylated collagen or wherein both, the top and bottom sealant, are polyethylene glycol cross-linked with methylated collagen.

33. (New) The method of claim 32 wherein the hydrostatic cyclic pressure is from about 0.05 MPa to about 3 MPa at 0.1 to about 0.5 Hz or constant pressure is from about zero to about 3 MPa above atmospheric pressure and wherein such pressure is applied for about 7 to about 28 days.

34. (New) The method of claim 33 wherein said hydrostatic pressure is preceded or followed by a period of about zero to about 28 days of atmospheric pressure.

35. (New) The method of claim 34 wherein said perfusion flow rate is from about 5 μL to about 50 μL/minute.

36. (New) The method of claim 35 wherein said perfusion flow rate is about 5 μL/minute.

37. (New) The method of claim 36 wherein said perfusion and pressure are applied at from about 2% to about 5% of oxygen concentration.